Sub Spec

PROCEDURE AND DEVICE FOR MANUFACTURING CRYSTALLIZABLE PLASTIC MATERIAL

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BACKGROUND OF THE INVENTION

The present invention relates to a procedure for manufacturing crystallizable plastic material, e.g., polyesters and the like, and in particular polyethylene terephthalate (PET), via post-melting phase crystallization and solid-phase post-condensation, and a device for executing the procedure.

The crystallization and post-condensation in the solid-phase (SSP) of polyesters obtained from a melt, in particular PET (polyethylene terephthalate), is generally known. In this case, the melted polyester (melting point 270 °C and [above] higher) is processed into cylindrical pellets, for example, while simultaneously cooled down to room temperature, and serves as an amorphous starting material for subsequent crystallization and post-condensation to PET. According to EP-A-379684, for example, crystallization takes place in two fluidized beds (combination of boiling and spouting beds) at temperatures of 140 °C to 180 °C. Crystallization is followed by exposure to impact to dissolve agglomerates.

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However, it is also known that crystallization can take place at a temperature of less than 140 °C and solid-state post-condensation can take place at a temperature exceeding 180 °C (e.g., according to the unpublished CH 02131/92-2).

EP-A-822214 describes a procedure in which a polymer material is extruded, pelleted and crystallized without cooling the melt to a temperature far below the crystallization temperature. In this case, a temperature of approx. 160 °C to 220 °C is maintained, and crystallization takes approx. 5 - 30 minutes. However, WO 97/23543 discloses this omission of strong cooling off during pelleting. Polyester is kept in a melt at approx. 270 °C, and drips through a hole onto a hot (approx. 135 °C) metal plate, where crystallization has already taken place. A conventional SSP process then follows this for 24 hours at approx. 205 °C. According to U.S. Patent No. 5,510,454, the temperature of the plate that receives the drops can also measure 180 °C.

Also known is a procedure for the simultaneous drying and crystallization of thermoplastics, e.g., PET according to WO94/25239, wherein plastic strands to be dried are quenched for at most 1.5 seconds to achieve a surface temperature of at least 100 °C. This partial cooling of the

plastic only reduces the crystallization time down to approx. 20 seconds at most.

In a device for manufacturing polyamides according to DE-A-19510698, a moving-bed reactor can be evacuated, wherein a vacuum pump can be provided with a separator for separating dust from the waste gas. However, solid foreign substances, dusts and the like are not reliably removed from the plastic material.

Further, U.S. Patent No. 3,405,098 describes a procedure for preparing linear condensation polyesters for solid phase polymerization, wherein the melt is quickly quenched in order to obtain an essentially amorphous, solid polyester, which is subsequently heated to 150 °C to 200 °C again, in order to obtain a partially crystallized polyester, which is subsequently milled into fine particles, and classified using sieves. The polyester prepared in this way is then subjected to solid-phase polymerization in a fluidized bed.

SUMMARY OF THE INVENTION

One of the objects of the present invention is to further develop a procedure for manufacturing crystallizable plastic material, such as polyester or PET, in such a way as

to achieve a higher reactivity in the SSP process through larger crystallites and improved surface crystal structure, and to reliably separate solid foreign substances from the plastic material after crystallization.

Another object of the present invention is to lower power consumption. This is accomplished based upon the features described in the claims.

Another object of the present invention is to provide a suitable device for executing the above procedure.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a schematic view of an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Preferred embodiments of the present invention are described in the claims.

The present invention shall be described in greater detail based upon the embodiment shown in Figure 1. Figure 1 shows a schematic view of the embodiment.

In particular, PET 1 exits a melt reactor (not shown) and enters a cutter 2 at a temperature of approx. 280 °C while being cooled and solidified.

The amorphous pellets 3 having a temperature of 140 °C to 180 °C generated in this way then pass to a fluidized bed 4 without further cooling, and subsequently to a sieve 5, which can be followed by a recirculating air sifter if required, in order to separate out dust and other foreign solids.

According to EP-A-379684, the fluidized bed 2 can also be a combination of boiling and spouted beds. If need be, the sieving process is followed by more crystallization (not shown).

The PET cleaned and crystallized passes in a conventional manner to a preheater 6 or directly to a shaft reactor 7, where the solid phase post-condensation into PET takes place, and only thereafter are the pellets cooled to room temperature in a cooler 8.